63. (Added) A method according to any one of claims 53 to 58 wherein the rewiped area is an area selected from the group consisting of an area f the same or a different electronic d vice.

64. (Added) A structure according to any one of claims 59 to 60 wherein the rewiped area is an area selected from the group consisting of an area of the same or a different electronic device.

REMARKS

Reconsideration is respectfully requested in view of any changes to the claims and the remarks herein. Please contact the undersigned to conduct a telephone interview in accordance with MPEP 713.01 to resolve any remaining requirements and/or issues prior to sending another Office Action. Relevant portions of MPEP 713.01 are included on the signature page of this amendment.

Claims 29, 35 and 53-60 have been rejected under 35 USC 112, first paragraph. The Examiner states:

> It appears that the original specification does not have support for the limitations of "the flexible contact elements deflect away from the original shape when said flexible contacts contact the electronic components; the flexible contact elements substantially return to the original shape when the flexible contact elements are withdrawn from contacting the electronic component" as recited in claims 29 and 53-60.

Applicants respectfully disagree.

The present specification teaches at page 12, second, paragraph:

> When the wire 130 is severed there is left on the surface 122 of pad 106 an angled flying lead 120 which is bonded to surface 122 at one end and the other end projects outwardly away from the surface. A ball can be formed on the end of the wire 130 which is not bonded to surface 122 using a laser or electrical discharge to melt the end of the wire. **Techniques for this are described in copending U.S. patent application Ser. No. 07/963,346, filed Oct. 19, 1992, which is incorporated herein by reference above.**.(emphasis added)

Incorporated U.S. patent application Ser. No. 07/963,346 is now issued as US 5,371,654.

The present specification teaches at page 13, lines 4-5, from bottom: **"the wires to flex under pressure** so that the probe ends in contact with the pad will move to wipe over the pad so that good electrical contact is made therewith.." (emphasis added) Flexing is described in detail in US 5,371,654, which is incorporated by reference.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 1, line 67- Col. 2, line 2:

> "Another object of the present invention is to provide such a packaging structures with both horizontal electrical interconnections and **compliant vertical electrical interconnections."**

As shown below compliant means to deflect under a force and to substantially return to the original shape when the force is removed.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 2. lines 3-6:

"A further object of the present invention is to provide such **structures which can be assembled and disassembled** into a plurality of subassemblies."

The purpose of being "assembled and disassembled" is for the structure to be reusable. To be reusable the elongated electrical conductors which under a force move away from the original position substantially return thereto when the force is removed.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 2, lines 9-11:

"Yet another object of the present invention is to provide such structures which **does not require rigid electrical interconnection** between subassemblies."

The non-rigid property results from the compliance of the elongated electrical conductors.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 6, lines 39-58:

"FIG. 6 shows substrate 94 and 96 pressed towards each other as indicated by arrows 98 and 100 with interposer 80 therebetween. The elastomer 82 acts as a spring to push the enlarged end contact surfaces 90 and 92 against mating contacts 104 and 106 on substrates 94 and 96 respectively. Surface 102 of substrate 94 has contact locations 104 which are typically metallized pad. Substrate 96 has contact locations 106 which are also typically metallized pads. **When substrate 94 is pressed towards substrate 96 the ends 90 and 92 move laterally with respect to the contact surface because conductors 84 are at a nonorthogonal angle with respect thereto. This lateral movement**

results in a wiping action which breaks a surfac oxid which is on the surface of the c ntact locati ns 104 and 106 and which is n th surface of th enlarged ends 90 and 92. The wiping acti n makes a good electrical contact between the enlarged surface 90 and 92 and th contact locati ns 104 and 106, respectively.

The wiping results from the compliance of the elongated electrical conductor moving away under a force from the original position to which it substantially returns when the force is removed. This is a result of the compliance of the elongated electrical conductor.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 4, lines 47-54:

> Substrate 8 is held in grooves in heat dissipation means 51 and 53 to ensure good thermal contact, mechanical support and **compresses the interconnection means** 49 between adjacent assemblies to provide electrical interconnection therebetween as described herein below.

The compressing is what provides the force which results in the compliant elongated electrical conductor deflecting away from the original position and the compliance is what results in the elongated electrical conductor substantially returning to the original position when the force is removed.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 5, lines 3-11:

> The structure of FIG. 1 is **compressed** from the top and bottom of the structure **to compress the electrical interconnection means** 46 between the adjacent

assemblies pressing electrical contact locations 30 on substrate 8 in contact with electrical contact locations 50 on electrical interconnection means 49 and pressing el ctrical contact locations 54 on electrical interconnection means 49 in contact with electrical contact locations 18 on the surface of the thin film wiring layer 12.

The compressing is what provides the force which results in the compliant elongated electrical conductor deflecting away from the original position and the compliance is what results in the elongated electrical conductor substantially returning to the original position when the force is removed.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 6, lines 4-6:

The **electrical interconnection means 49** can be fabricated to be approximately 1 millimeter thick with 10 percent **compliance**.

The elongated electrical conductors are compliant, that is they move away from the original position upon application of a force and substantially returns to the original position when the force is removed.

US 5,371,654, which is incorporated by reference teaches (emphasis added):

Col. 6, lines 20-21:

"The connection is separable."

The purpose of seperability is to reuse the connector. The connector is reusable only if the elongated electrical conductors move away and substantially return to the original position upon application and removal of a force.

The last sentence of the originally filed abstract reads:

> "The ends of the plurality of conductors in the electrical interconnection means are fabricated so that **upon compression between adjacent assemblies there is a wiping action between the conductor ends and contact locations on the adjacent assemblies to form a good electrical contact therewith.**"

The wiping action results from the elongated electrical conductor moving away from their original position upon application of a force which results from moving the elongated electrical conductor against a surface. Since the elongated electrical conductor is compliant it substantially returns to the original position when the force is removed such as when the connection is separated, for example, when the elongated electrical conductor is moved away for the surface.

The International Dictionary of Electronics (1956) at page 342 (See Attachment A) defines "Flexture" as "[a] term which is used to devote the curved or bent state of a loaded beam ... In flexure, an elastic structural material undergoes or deflection sufficient to set up in its material stresses which will support the load." And at pages 274-275, Elasticity is defined as "[t]he property whereby a body, when deformed, automatically recovers its normal configuration as the deforming forces are removed."

Thus a elongated electrical conductors which flex under a force move away from an original position and substantially return to the original position when the force is removed.

Webster's Third New International Dictionary (1981) page 465 (See Attachment B) defines "compliance" to mean "3: the quality or state of yielding to bending under stress within the elastic limit," that is there is substantially no deformation.

Thus a elongated electrical conductors which flex under a force move away from an original position and substantially returns to the original position when the force is removed. When the compliant material is bent beyond the elastic limit it buckl s, deforms or crumples.

In view of the remarks herein it is clear that Applicants teach:

> "the flexible contact elements deflect away from the original shape when said flexible contacts contact the electronic components; the flexible contact elements substantially return to the original shape when the flexible contact elements are withdrawn from contacting the electronic component" as recited in claims 29 and 53-60."

To further examination, notwithstanding Applicants' disagreement with the Examiner's rejections, claims 29 and 53-60 have been amended to use the specific more generic words from Applicants teaching.

In view of the remarks herein withdrawal of the rejection of claims 29, and 53-60 under 35 USC 112, first paragraph, is respectfully requested.

Claims 42-52 have been rejected under 35 USC 112, second paragraph. Applicants respectfully disagree and request withdrawal thereof.

Applicants repeat their comments from the prior response. The Examiner has not shown why these comments do not overcome this rejection. As to claim 42 a "socket" is shown in Fig. 2 and described at page 8, line 2, as element 66. As to claim 45 there is no recitation "is interrelated and associated with the first substrate". As to claim 49 the recitation "means within said first substrate" is supported by the specification as follows. The specification at page 7, lines 14-17 state that "Space transformer 54 is a multilevel metal/ceramic substrate, a multilevel metal/polymer substrate or a printed circuit board which are typically used as packaging substrate for integrated circuit chips"

which a person of skill in the art knows contain means therein "for connecting terminals to contacts". Moreover US 5,371,654 incorporated by reference (See above) shows in Fig. 1 substrate 8 with electrical conductors 20 therein. Th "language plurality of first substrates", is supported as follows. Figs. 1 and 4 of US Patent 5,371,654 (incorporated by reference at page 8 lines 18-20 of the specification) teaches a plurality of first substrates 49 mounted on second substrate 8. (See Attachment C) Fig. 2 of the present application shows first substrate 60 mounted into second substrate 68. Each substrate 49 of Fig. 4 of US 5,371,654 can be substrate 60 of Fig. 2 of the present application. As to claim 51 the second substrate corresponds to 49 of Figs. 1 and 4 of US Patent 5,371,654 and the first substrate corresponds to 8 of Figs. 1 and 4 thereof. In regards to claim 52 the Examiner states "it is not clear what a plurality of said second substrates represent". Figs. 1 and 4 of US Patent 5,371,654 clearly shows a plurality of second substrates 49 mounted onto first substrate 8. Fig. 3 of the present application shows first substrate 68 and second substrate 60. Moreover, Fig. 3 of the present application shows an example of an embodiment where substrate 54 is electrically coupled to substrate 68 by pins 64 and socket 66. A plurality of substrates are shown in US Patent 5,376,654 as 49 for providing electrical coupling to other electronic structures. Thus, a plurality of substrates 60 shown in Fig. 5 of the present application can be interconnected by a substrate 68.

Claims 30-51 have been rejected under 35 USC 102(b) as anticipated by Bove et al. (US 4,078,599). Applicants repeat their comments from the prior response. Applicants respectfully disagree and request withdrawal thereof. Bove et al. teaches buckling which is stressing a beam beyond the elastic limit. This is not flexure or compliance. Bove et al. teaches wires 16 that are straight and perpendicular to substrate 14. (See Fig. 2 of Bove et al.). This, configuration results in the wires 16 being compressed when the wires 16 are pressed against a device under test. Since the wire is straight and perpendicular, the end of the wire that is pressed against the device under test remains fixed in position and the wire buckles. In contradistinction, Applicants' claim conductors with free ends which laterally move or wipe the area against which they are pressed. There is no such teaching in Bove et al. A buckling beam test probe

assembly is shown in US 5,367,254. (See Attachment D) In US 5,367,254 when end 12 of wire 6 is pressed against a pad 3 on substraight 4 the straight wire 6 becomes buckled wire 5 and end 12 of wires 6 is in the same position relative to the pad 3. Thus, there is no wiping of the surface of pad 3. Since the wire 6 buckles to become wire 5 when the end 12 is removed from contact with pad 3, the wire 5 remains buckled and does not return to the original shape and position of wire 6. Moreover, present claims 37 and 43 clearly recites that "a free end thereof laterally moves when pressed against the area of the electronic device." Claims 45 and 49 have a similar recitation. The wires are shaped so that a free end thereof laterally movers when pressed against the area of the electronic device". There is clearly no such teaching in Bove et al. Moreover, claim 38 recites "The electronic device is a printed circuit board" for which there is no teaching in Bove et al. Moreover, claim 34 recites "The electronic device is a packaging substrate" for which there is no teaching in Bove et al. Moreover, claim 37 recites "the flexible elements further include a protuberance at an end thereof" for which there is no teaching in Bove et al. Claims 30-51 recite a flexible conductor or similar recitation for which there is no teaching or suggestion in Bove et al.

The Examiner refers to element 19 of Bove as being flexible element. Applicants respectfully disagree for the reasons given in the prior response repeated below, to which the Examiner did not respond. Bove et al. provides no description of "probes 19" other than to call "19" a probe. At Col. 5, lines 10-21, Bove et al. states "[t]he assembly of probes maybe similar to, or patterned after the probe assembly disclosed ... in ... Bove US Patent No. 3,806,801.", which is entitled "Probe Contactor Having Buckling Beam Probes". The American Heritage Dictionary, Second College Edition, defines buckle to mean "to cause to bend, warp or crumple". US Patent 5,367,254 shows a picture of a buckled beam. See the copy of this patent enclosed with the prior response and the figure therefrom in Attachment D which shows a buckled beam 5 in the figure thereof. In contradistinction, all of Applicants' claims recite flexible conductor or similar recitation. Bove et al. '599 teaches away from all of Applicants' claims since it teaches "buckling beams which warp or crumple". A crumpled beam cannot flex within the scientific meaning of the term described above. Fig. 8 of US Patent 3,806,801 (referred

to by Bove et al.) shows graphically the relationship of force and deflection of an axially loaded probe as taught in Bove t al. '599. The buckling of this prob is described at Col. 1, lines 54-64 and Col. 6, lines 10-35 of US 3,806,801, in particular, Col. 6, lines 27-30 teaches, "The wire 16 of the probe 15 is designed in accordance with formula ... where F is an axial load on the end of the wire 16 which will cause buckling of the wire 16." It is thus clear that Bove et al. US Patent 4,038,599 does not teach or suggest a flexing conductor, but in fact teaches away since it teaches a buckled conductor.

The only comment that the Examiner has made to these remarks at page 4 of the office action is "it appears that the probes of Bove et al are flexible conductors since everything has a degree of flexibility. Therefore, Bove et al meet the limitations of the instant claims." Applicants respectfully disagree. Bove et al. teaches a deformed beam. Bove et al. does not teach a flexible elongated conductor as recited in Applicants' claims.

In view of the remarks herein withdrawal of the rejection of claims 30-51 under 35 USC 102(b) as anticipated by Bove et al. is respectfully requested.

In view of the changes to the claims and the remarks herein, the Examiner is respectfully requested to reconsider the above-identified application. If the Examiner wishes to discuss the application further, or if additional information would be required, the undersigned will cooperate fully to assist in the prosecution of this application.

Please charge any fee necessary to enter this paper and any previous paper to deposit account 09-0468.

If the above-identified Examiner's Action is a final Action, and if the above-identified application will be abandoned without further action by applicants, applicants file a Notice of Appeal to the Board of Appeals and Interferences appealing the final rejection of the claims in the above-identified Examiner's Action. Please charge deposit account 09-0468 any fee necessary to enter such Notice of Appeal.

In th event that this amendment does not result in allowance of all such claims, the undersigned attorney respectfully requests a telephone interview at th Examiner's earliest convenience.

MPEP 713.01 states in part as follows:

> Where the response to a first complete action includes a request for an interview or a telephone consultation to be initiated by the examiner, ... the examiner, as soon as he or she has considered the effect of the response, should grant such request if it appears that the interview or consultation would result in expediting the case to a final action.

Respectfully submitted,

By: _____
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APPENDIX

29. (Rewritten) A method of probing an electronic device by contacting the electronic device with a plurality of flexible contact elements, the method comprising the steps of:

providing a first substrate corresponding to an area of the electronic device to be probed, said substrate having a front surface;

mounting and connecting a second substrate to the front surface of the first substrate, said second substrate having a plurality of flexible contact elements bonded to and extending from a surface thereof;

urging the first substrate and the electronic device towards one another so that the flexible contact elements make contact with a surface of the electronic component, the flexible contact elements have an original shape;

the flexible contact elements flex and wipe the surface of the electronic component when the flexible contacts contact the electronic components; and

the flexible contact elements substantially compliantly respond when the flexible contact elements are withdrawn from contacting the electronic component.

30. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein the electronic device is a semiconductor wafer.

31. A method according to claim 30, wherein the area is a plurality of integrated circuits on the semiconductor wafer; and the flexible contacts make contact with the plurality of die sites all at once.

D3 32. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein the area of the electronic device is a portion of a surface area of the electronic device.

33. A method of probing an electronic device by contacting the electronic device with a plurality of flexible contact elements, the method comprising the steps of:

providing a first substrate corresponding to an area of the electronic device to be probed, said substrate having a front surface;

mounting and connecting a second substrate to the front surface of the first substrate, said second substrate having a plurality of flexible contact elements bonded to and extending from a surface thereof;

urging the first substrate and the electronic device towards one another so that the flexible contact elements make contact with the electronic component, and the electronic device is a printed circuit board.

34. A method of probing an electronic device by contacting the electronic device with a plurality of flexible contact elements, the method comprising the steps of:

providing a first substrate corresponding to an area of the electronic device to be probed, said substrate having a front surface;

mounting and connecting a second substrate to the front surface of the first substrate, said second substrate having a plurality of flexible contact elements bonded to and extending from a surface thereof;

urging the first substrate and th electronic device towards one anoth r so that the fl xible contact elements make contact with the electronic component, and the electronic device is a packaging substrate.

35. A method according to claim 29, wherein the flexible elements are probe elements.

36. A method of probing an electronic device by contacting the electronic device with a plurality of flexible contact elements, the method comprising the steps of:

providing a first substrate corresponding to an area of the electronic device to be probed, said substrate having a front surface;

mounting and connecting a second substrate to the front surface of the first substrate, said second substrate having a plurality of flexible contact elements bonded to and extending from a surface thereof;

urging the first substrate and the electronic device towards one another so that the flexible contact elements make contact with the electronic component, and the flexible elements further includes a protuberance at an end thereof.

37. (Rewritten) A method of probing an electronic device by contacting the electronic device with a plurality of flexible contact elements, the method comprising the steps of:

providing a first substrate corresponding to an area of the electronic device to be probed, said substrate having a front surface;

mounting and connecting a second substrate to the front surface of the first substrate, said second substrate having a plurality of flexible contact elem nts bonded to and extending from a surface thereof;

D4 urging the first substrate and the electronic device towards one another so that the flexible contact elements make contact with the electronic component, and the flexible elements are wires disposed on the surface of the second substrate, the wires are shaped so that a free end thereof laterally moves when pressed against the area of the electronic device.

D5 38. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein there are electrical connections between the second substrates and the first substrate.

D6 39. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein the first substrate is a space transformer.

D7 40. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein the electronic device is a semiconductor wafer; and the flexible contact elements of the second substrate contact individual semiconductor dies on the semiconductor wafer.

D8 41. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein the electronic device is a semiconductor wafer; and the flexible contact elements of the second substrate contacts at least one integrated circuit on the semiconductor wafer.

D9 42. (Rewritten) A method of probing an electronic device by contacting the electronic device with a plurality of flexible contact elements, the method comprising the steps of:

providing a first substrate corresponding to an area of the electronic device to be probed, said substrate having a front surface;

mounting and connecting a second substrate to the front surface of the first substrate, said second substrate having a plurality of flexible contact elements bonded to and extending from a surface thereof;

D9

urging the first substrate and the electronic device towards one another so that the flexible contact elements make contact with the electronic component so that a free end of the flexible contact elements laterally move when pressed against the area of the electronic device, and the second substrate is aligned to the first substrate by a socket.

43. (Rewritten) A method of probing an electronic device by contacting the electronic device with a plurality of flexible contact elements, the method comprising the steps of:

D10

providing a first substrate corresponding to an area of the electronic device to be probed, said substrate having a front surface;

mounting and connecting a second substrate to the front surface of the first substrate, said second substrate having a plurality of flexible contact elements bonded to and extending from a surface thereof;

urging the first substrate and the electronic device towards one another so that the flexible contact elements make contact with the electronic component so that a free end of the flexible contact elements laterally move when pressed against the area of the electronic device, and the first substrate with the second substrate mounted thereto is mounted to an electrical testing apparatus.

44. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein th first substrate with the second substrate mounted thereto is mounted to an electrical testing apparatus by a plurality of electrical connections.

D11

45. (Rewritten) A probe card assembly comprising:

D12

a probe card;

a first substrate having a top surface, a bottom surface, a first plurality of terminals disposed on the top surface, and a second plurality of terminals disposed on the bottom surface;

at least one second substrate having a top surface and a bottom surface;

means for effecting electrical connections between the at least one second substrate and the first substrate;

a plurality of probe elements disposed on the top surface of the at least one second substrate; and

the probe elements are free-standing flexible conductors shaped so that a free end thereof laterally movers when pressed against a surface.

46. A probe card assembly, according to claim 45, wherein the probe elements are free-standing flexible conductors.

47. A probe card assembly, according to claim 45, wherein tip structures are mounted to ends of the plurality of free-standing flexible conductors.

48. A probe card assembly, according to claim 45, wherein the free-standing flexible conductor further includes a protuberance at an end thereof.

49. (Rewritten) A structure comprising:

a plurality of first substrates adapted to be mounted to a second substrate;

DB

each of the first substrates having two opposite surfaces;

free standing flexible conductors extending from one of the two surfaces shaped so that a free end thereof laterally movers when pressed against a surface;

9 terminals on an other of the two opposite surfaces;

means, within each of the first substrates, for connecting the terminals to the contacts; and

the plurality of the first substrates are mounted on to the second substrate.

DA

50. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, further including plurality of groups of said plurality of the flexible electrical contact elements.

DB

51. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wherein there is a least one of said second substrates mounted to said first substrate.

52. (Rewritten) A method according to any one of claims 33, 34, 36, 37, 42, 43 or 53 to 60, wh rein there are a plurality of said second substrates mounted to said first substrate.

53. (Rewritten) A method according to claim 33 where each of said plurality of flexible contact elements flex and wipe the area of the electronic device when said flexible contacts contact the electronic device; the flexible contact element substantially compliantly respond when the flexible contact element are withdrawn from contacting the electronic device.

54. (Rewritten) A method according to claim 34 where each of said plurality of flexible contact elements flex and wipe the area of the electronic device when said flexible contacts contact the electronic device; the flexible contact element substantially compliantly respond when the flexible contact element are withdrawn from contacting the electronic device.

55. (Rewritten) A method according to claim 36 where each of said plurality of flexible contact elements flex and wipe the area of the electronic device when said flexible contacts contact the electronic device; the flexible contact element substantially compliantly respond when the flexible contact element are withdrawn from contacting the electronic device.

56. (Rewritten) A method according to claim 37 where each of said plurality of flexible contact elements flex and wipe the area of the electronic device when said flexible contacts contact the electronic device; the flexible contact element substantially compliantly respond when the flexible contact element are withdrawn from contacting the electronic device.

57. (Rewritten) A method according to claim 42 where each of said plurality of flexible contact elements flex and wipe the area of the electronic device when said flexible contacts contact the electronic device; the flexible contact element substantially

compliantly respond when the flexible contact element are withdrawn from contacting the electronic device.

58. (Rewritten) A method according to claim 43 where each of said plurality of flexible contact elements flex and wipe the area of the electronic device when said flexible contacts contact the electronic device; the flexible contact element substantially compliantly respond when the flexible contact element are withdrawn from contacting the electronic device.

D17

59. (Rewritten) A probe card according to claim 45 wherein said freestanding flexible conductors are shaped to flex and wipe the area of the electronic device, the freestanding flexible conductors substantially compliantly respond when the flexible contact elements are withdrawn from contacting the electronic component.

60. (Rewritten) A probe card according to claim 49 wherein said freestanding flexible conductors are shaped to flex and wipe the area of the electronic device, the freestanding flexible conductors substantially compliantly respond when the flexible contact elements are withdrawn from contacting the electronic component.

61. (Added) A method according to any one of claims 53 to 58 wherein the flexible contact elements can be repeatably assembled and disassembled so that said flexible contact element can recontact, reflex and rewipe the area of the electronic device.

D18

62. (Added) A structure according to any one of claims 59 to 60 wherein the flexible contact elements can be repeatably assembled and disassembled so that said flexible contact element can recontact, reflex and rewipe the area of the electronic device.

63. (Added) A method according to any one of claims 53 to 58 wherein the rewiped area is an area selected from the group consisting of an area of the same or a different electronic device.

64. (Added) A structure according to any one of claims 59 to 60 wherein th rewiped area is an area selected from the group consisting of an area of the same or a different electronic device.

D18

ATTACHMENT A

THE INTERNATIONAL DICTIONARY OF PHYSICS AND ELECTRONICS

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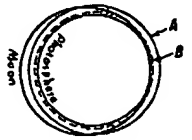
cathode thought to be due to irregularities in the cathode surface.

FLASHBACK VOLTAGE. The peak inverse voltage at which ionization occurs in a gas-tube.

FLASH POINT. The lowest temperature at which a substance will decompose to an inflammable gaseous mixture, demonstrable through its explosive quality.

FLASHOMETER. A device for studying the time-intensity distribution of flashes of light.

FLASH SPECTRUM. At the instant of second or third contact during a total solar eclipse the edge of the moon is tangent to the photosphere of the sun as shown in the figure.



With the photosphere (*B*) covered, the highly heated atmosphere of the sun, known as the reversing layer and the chromosphere (*A*), flashes into view. With the photosphere covered the continuous spectrum of the sun is cut off and the bright-line spectrum radiated by the atmosphere may be observed.

FLAT SPACE-TIME. Space-time for which the Riemann-Christoffel tensor vanishes. The metric can then always be chosen thus

$$g_{\mu\nu} = \delta_{\mu\nu}, \text{ if } x_4 = ict.$$

F LBF S SYSTEM OF UNITS. Any system of units based on the choice of the foot, the pound force and the second as fundamental quantities. (See Introduction.)

FLEMING VALVE. An early thermionic diode used as a detector.

FLETCHER-MUNSON CONTOURS. Equal loudness curves for pure tones (see tone, simple), plotted as contours on a sound pressure–sound frequency graph.

FLEXION-POINT EMISSION CURRENT. That value of current on the diode characteristic for which the second derivative of the current with respect to the voltage has its maximum negative value. This current corresponds to the upper flexion point of the diode characteristic, and is an approximate measure of the temperature-limited emission current.

FLEXURAL WAVE. See wave, flexural.

FLEXURE. A term which is used to denote the curved or bent state of a loaded beam. A horizontally located beam, transversely loaded with vertically directed load, offers an example of load-carrying ability derived through flexure. In flexure, an elastic structural material undergoes a deflection sufficient to set up in its material stresses which will support the load. Deflection under load is an essential and necessary part of the process of load carrying by a beam, for until the deflection has occurred, there are set up in the beam no resisting forces. Thus if an unloaded beam is perfectly straight and horizontal, it must assume a slightly curved position if any external load is supported by it. The only way in which a loaded beam could be straight would be to have had an initial deflection in a direction opposite to the loading.

FLICKER. The sensation produced by a fluctuation in brightness at a rate comparable to the reciprocal of the period of persistence of vision.

FLICKER EFFECT. Minute variations in the cathode current of thermionic vacuum tubes which may be caused by random changes in cathode activity or positive ion emission.

FLICKER PHOTOMETER HEAD. A bench photometer head in which, by means of a rotating sector-disk, the two illuminations to be compared are presented to the observer in rapid alternation (but not too rapid), any difference between them being detected as a noticeable flicker. This type of photometer is especially useful when the sources are not of exactly the same color.

FLIP-FLOP CIRCUIT. (1) An Eccles-Jordan circuit or bistable multivibrator. (2) The use of this term in color television, for color-phase alternation, should be avoided.

FLOATING BODY, STABLE EQUILIBRIUM OF. See stable equilibrium of floating body.

FLOATING BODY, UNSTABLE EQUILIBRIUM OF. See unstable equilibrium of floating body.

forces are removed. Each of its several types is probably due to the action of intermolecular forces which are in equilibrium only for certain configurations.

Deformation or, more briefly, strain is of various kinds; in each case its measure is a certain abstract ratio. For example, the elongation of a rod under tension is expressed as the ratio of the increase in length to the unstretched length. Linear compression is the reverse of elongation. They are both accompanied by a fractional change in diameter, the ratio of which to the elongation is called the Poisson ratio. Shear is a strain involving change of shape, such that an imaginary cube traced in the unstrained material becomes a rhombic prism. The measure of shear is the tangent of the angle through which the oblique edges have been made to depart from their original perpendicular direction. Volume strain is the ratio of a decrease in volume to the normal volume. **Flexure** or bending, and torsion or twisting, are combinations of these more elementary strains. A straight rod bent into a plane curve undergoes elongation on the convex side and linear compression on the concave side, while there is an intermediate neutral layer which suffers neither.

For every strain there arises, in an elastic substance, a corresponding stress, which represents the tendency of the substance to recover its normal condition. Stress is expressed in units of force per unit area. Tensile stress, for example, is the ratio of the force of tension to the normal cross-section of the rod subjected to it. Shearing stress is the force tending to push one layer of the material past the adjacent layer, per unit area of the layers. Pressure, expressed in like units, is the stress corresponding to volume compression, etc.

For each type of strain and stress there is a modulus, which is the ratio of the stress to the corresponding strain. In the case of elongation or linear compression, it is commonly called the **Young modulus**; we also have the **bulk modulus** and the **shear modulus** or rigidity.

In engineering design the Young modulus is used for tension and compression and the rigidity modulus for shear, as in torsion springs. (See **Hooke law.**)

ELECTRALLOY. An alloy of iron frequently used for chassis or panels in electronic equipment.

ELECTRET. A permanently-polarized piece of dielectric material; the analog of a magnet. Barium titanate ceramics, preferably containing a small percentage of lead titanate, can be polarized by cooling from a temperature above the Curie point in an applied electric field. Electrets are also produced by solidification of mixtures of certain organic waxes in a strong electric field.

ELECTRIC AND MAGNETIC DOUBLE REFRACTION. In 1875 Kerr discovered that glass and many other isotropic, transparent solids and liquids exhibit **double refraction** like crystals, when placed in a strong electric field; and in 1905 Cotton and Mouton, after some preliminary results by Kerr and others, demonstrated the corresponding phenomenon with a magnetic field. These are now known respectively as the Kerr electro-optical effect and the Cotton-Mouton effect. In both cases the magnitude of the effect, as measured by the phase difference produced per unit thickness of medium, is, for a given substance, wavelength, and temperature, proportional to the square of the field intensity. The optic axis of the doubly refracting substance corresponds to the direction of the imposed field.

Of the two phenomena the Kerr effect is much more pronounced and is as yet the only one of practical importance. The Kerr cell, in which nitrobenzene, a liquid, is commonly employed because of its large and quick response to the electric field, has in recent years been extensively used as an electro-optical control or shuttter for light beams, for example, in the recording of sound pictures. Recently, ferrites have been used to rotate the **plane of polarization** of microwaves, in the presence of a magnetic field.

ELECTRIC(AL) AXIS. The axis of a crystal which offers minimum resistance to the passage of current.

ELECTRIC(AL) BRIDGE. See **bridge, electrical.**

ELECTRIC(AL) CONDUCTIVITY, THEORY OF. See **conductivity, electrical.**

ELECTRIC CONSTANT. (Symbol ϵ_0 or γ_e.) The electric constant pertinent to any system of units is the scalar dimensional factor ϵ_0 appearing in the **Coulomb law of force** between two charges in vacuo:

$$F = q_1 q_2 / n\epsilon_0 r^2$$

consistent with the laws of Newton and of Coulomb, although Einstein believed that such general arguments were not applicable.

EINSTEIN UNIT. A photochemical unit quantity defined under the heading Stark-Einstein equation.

EINSTEIN UNIVERSE. Model of the universe in which the interval between two events is given by

$$ds^2 = c^2dt^2 - r^2(d\theta^2 + \sin^2\theta d\phi^2) - \frac{dr^2}{1 - r^2/R^2}$$

where R is the radius of the universe. The model may be regarded as a four-dimensional cylindrical surface embedded in five-dimensional space.

EINSTEIN VISCOSITY EQUATION (FOR SOLS). For a suspension of rigid spheres

$$\eta_{sp} = \frac{\eta}{\eta_0} - 1 = 2.5\phi$$

where η_{sp} is the specific viscosity, η_0 is the viscosity of pure solvent, and ϕ is the volume fraction of the disperse phase, and is equal to the volume of the spheres (or particles), divided by the total volume.

In the derivation the following assumptions are made:

1. The radii of the spheres are large compared with those of the solvent, but small compared with the dimensions of the apparatus.
2. The distance between the spheres is large compared with their radius, i.e., the volume concentration of the particles is small.
3. The effects of gravitation and inertia are negligible.

EINSTEINIUM. See Element #99.

ELASTANCE. The reciprocal of capacitance, measured in darafs.

ELASTIC AFTER-EFFECT OR LAG. The time delay which some substances exhibit in returning to original shape after being stressed within their elastic limits. There is some evidence that the magnitude of this time depends on the homogeneity of structure of the substance. For instance, quartz, which has a homogeneous structure, shows almost no lag. Glass, which is a mixture of aggregates, can have a time delay of the order of hours.

ELASTIC AXIS. See flexure.

ELASTIC COEFFICIENTS, LATTICE THEORY OF. The elastic constants and elastic moduli of crystals may be calculated on the assumption that the only forces are those between near neighbors in the lattice. Such a calculation gives reasonable results for ionic crystals, but is quite unsatisfactory for metals, where the Cauchy relations are not obeyed. The free electron gas in a metal is not easily compressed but scarcely opposes shear.

ELASTIC COLLISION. See collision, elastic.

ELASTIC CONSTANTS (ALSO KNOWN AS COMPLIANCE CONSTANTS). The coefficients of the relations by which the components of the elastic strain are expressed as linear functions of the stress components. In general there are 21 different coefficients, but the number may be reduced by the crystal symmetry of the solid. (See also Voigt notation.)

ELASTIC CURVE. The curve of the neutral surface of a structural member subjected to loads which cause bending is called the elastic curve. The ordinates between this curve and the original position of the neutral surface represent the deflections due to bending.

ELASTIC HYSTERESIS CONSTANT. The ratio of the area (expressed in energy units) of the stress-strain loop, for a unit volume of the material, to the square of the maximal strain.

ELASTIC LIMIT. The maximum unit stress which can be obtained in a structural material without causing a permanent deformation is called the elastic limit.

ELASTIC MODULI (OR STIFFNESS CONSTANTS). The coefficients of the relations by which the components of stress are expressed as linear functions of the components of the elastic strain. The number of these depends on the crystal symmetry of the material. (See also Voigt notation.)

ELASTIC SCATTERING. See scattering, elastic.

ELASTICITY. The property whereby a body, when deformed, automatically recovers its normal configuration as the deforming

SN 09/382,834

D. VAN NOSTRAND COMPANY, INC.

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257 Fourth Avenue, New York 10, New York
25 Hollinger Rd., Toronto 16, Canada
Macmillan & Co., Ltd., St. Martin's St., London, W.C. 2, England

All correspondence should be addressed to the principal office of the company at Princeton, N. J.

Published simultaneously in Canada by
D. Van Nostrand Company (Canada), Ltd.

Library of Congress Catalogue Card No.: 56-11759

First Printing, August 1956
Second (Prepublication) Printing, August 1956

PRINTED IN THE UNITED STATES OF AMERICA

D. VAN NOSTRAND COMPANY, INC.

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OF THE ENGLISH LANGUAGE UNABRIDGED

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REG. U.S. PAT. OFF.

Utilizing all the experience and resources of more than one hundred years of Merriam-Webster® dictionaries

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MERRIAM-WEBSTER INC., *Publishers*
SPRINGFIELD, MASSACHUSETTS, U.S.A.

ATTACHMENT B

Library of Congress Cataloging in Publication Data
Main entry under title:

Webster's third new international dictionary of the English language, unabridged.

Includes index.
1. English language—Dictionaries. I. Gove, Philip Babcock, 1902–1972. II. G. & C. Merriam Company.
PE1625.W34 1981 423 81-16878
ISBN 0-87779-201-1 (blue Sturdite)
ISBN 0-87779-206-2 (imperial buckram) AACR2

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changed in ~ of the town hall from bright newness to mild conformity with neighboring structures〉〈th warlike ~ of th news〉 **5** [L *complexus*, *complexio*] *archaic* : COMBINATION, AGGREGATE **Syn** see DISPOSITION

²complexed *adj* \"\ *vt* -ED/-ING/-S [ME *complexioumen* to compose, fr. *complexioun*, n.] : to give a color or particular slant to : TINGE 〈th early sun ~*ing* th mountains〉 〈propaganda ~*ed* his views〉

com·plex·ion·al \-shən°l, -shnəl\ *adj* [ME, fr. ML *complexionalis*, fr. *complexion-*, *complexio* + L *-alis* -al] : for or relating to physical constitution or mental temperament 〈his ~ hue〉 〈~ political views〉 — **com·plex·ion·al·ly** \-ᵊlē, -əlē, -li\ *adv*

com·plex·ioned \kəm'plekshənd\ *adj* [ME *complexioumed*] having a (specified) bodily constitution, fr. *complexioun* + *-ed*] : having a (specified) facial complexion — used chiefly in combination 〈a dark-*complexioned* girl〉 〈a muddy-*complexioned* man〉

com·plex·ion·less \-nləs\ *adj* : lacking color : PALE

com·plex·i·ty \käm'pleksəd-ē, kəm-, -ətē, -i\ *n* -ES **1** : the quality or state of being complex : COMPOSITENESS, INTRICACY 〈the ~ of modern society〉 〈the ~ of an adding machine's mechanism〉 **2** : something complex : an intricacy or complication 〈the political *complexities* of his office〉

com·plex·ly \(')käm'pleklē, kəm'-, -li\ *adv* : in a complex manner

complex mode *n* : a mode that according to the philosophy of the 17th century English philosopher John Locke results from the combination of simple ideas of several kinds (as beauty, gratitude) — contrasted with *simple mode;* compare ¹MODE 6

com·plex·ness \-snəs\ *n* -ES : COMPLEXITY

complex number *or* **complex quantity** *n* : a number or expression of the form $a+bi$, where a and b are real numbers and $i=\sqrt{-1}$

complex plane *n* : a plane whose points are identified by means of complex numbers

complex unit *n* : a complex number $a+ib$ whose absolute value $\sqrt{a^2+b^2}$ is 1

com·plex·us \käm'pleksəs, kəm-\ *n*, *pl* **complexus** [L, surrounding, embrace — more at COMPLEX] : an interwoven complicated aggregate of parts : COMPLEX 〈the entire cultural ~ —James Collins〉 〈a baffling ~ of her own imaginings —John Farrelly〉

complex variable *n* : a number or expression of the form $x+iy$ where $i=\sqrt{-1}$ and x and y are in general variables

com·pli·a·ble \kəm'plīəbəl\ *adj* [*comply* + *-able*] **1** *archaic* : disposed or apt to agree or yield : COMPLIANT **2** *obs* : that may be reconciled — **com·pli·a·bly** \-blē\ *adv*

com·pli·ance \kəm'plīən(t)s\ *n* -S [*comply* + *-ance*] **1** *obs* **a** : CIVILITY **b** : friendly or happy agreement : HARMONY, CONCORD 〈~ between man and wife〉 **2 a** : the act or action of yielding to pressure, demand, or coercion : CONFORMANCE 〈the Counter Reformation was not a ~ with Reform but a defiance of it —H.R.Trevor-Roper〉 **b** : inclination or readiness to yield to the demands of others often in a servile or spineless fashion 〈worthy men may be rejected because of their very virtues and unworthy men selected because of their ~ —P.H.Douglas〉 **3** : the quality or state of yielding to bending under stresses within the elastic limit; *also* : the amount of displacement per unit of applied force **4 a** : conformity in fulfilling formal or official requirements 〈a letter written in ~ with U.S. Army style〉 〈the . . . provision was designed to tighten ~ with acreage allotments —*Wall Street Jour.*〉 **b** : cooperation promoted by official or legal authority or conforming to official or legal norms 〈cheerful, spontaneous cooperation and ~ to orders are results of proper discipline under a respected leader —A.A.Ageton〉 〈an official oath of ~ with the statute —Florence Mishnun〉 〈insure the ~ of all . . . nations —*U. N. Disarmament Commission Resolution*〉

com·pli·an·cy \-nsē, -i\ *n* -ES [*comply* + *-ancy*] : COMPLIANCE

com·pli·ant \-ənt\ *adj* [*comply* + *-ant*] **1** : ready, disposed, or

what is due, be courteous 〈 -ment — more at COMPLETE speech, gesture, or ceremor admiration 〈each candidat ~*s*〉 〈a party given in ~ to : th name to Fort Knox, in Hay〉; *specif* : a remark in his best girl all sorts of ~*s*〉 consideration 〈he cam ni behooves us . . . to pay the of their language —Kenn : best wishes : REGARDS 〈to sample is enclosed with the *dial* : a complimentary gift :

²com·pli·ment \-ˌment, -m [F *complimenter*, fr. *comp* ceremoniously or flatterin 〈~*ing* his friend on the ste —Benjamin Farrington〉 〈 shower given in her ho **2** : to present (a person) fection, or admiration 〈 **3** : CONGRATULATE 〈~*ed* hi pay compliments 〈refuse to

com·pli·men·tal \ˌkämplə'; 〈his pleasing ~ remarks〉 . ments — **com·pli·men·tal**

com·pli·men·tar·i·ly \ˌkä -ˌmen·trəl-, -ntərəl-\ *adv* : i

com·pli·men·ta·ri·ness \ˌ -ES : the quality or state of

com·pli·men·ta·ry \ˌkämp pressing regard or praise 〈t *rent Blog.*〉 : of the natur 〈references to his colleagu using compliments 〈a perso given free esp. as a courte given all who donate over

complimentary close *or* **co** or words that convention signature of a letter and ex ceiver (as *very truly yours,*

com·pline \'kämplən, -ˌplīn *cap* [ME *compline*, *compell* (influenced by *complir* to a fill up) of LL *completa*, fr. more at COMPLETE] *Christia* canonical hours : the last after nightfall or just befor

¹com·plot \'käm,plät\ *n* - throng, plot] *archaic* : PLO

²com·plot \käm'plät, kəm **complotting; complots** *archaic* : to plot together

complt *abbr* complainant

com·plu·ten·sian \ˌkämpl *plutensis* (fr. *Complutum*, *Henares*) + E *-ian*] : of published in Alcalá de He taining the Old Testament on the Pentateuch, the Sept New Testament 〈the *Com*

com·plu·vi·um \kəm'plüvi \-ēə\ [L, fr. *compluere* to rain — more at FLOW] : a ancient Roman atrium to through which the rain fe

¹com·ply \kəm'plī\ *vb* -*cumplir* to complete, acco courteous, fr. *cumplir*, *complere*, *obs* **a** : to be ceremonio

[illegible]

the logician, the psychologist, and the critical philosopher to clear up for us —Edward Sapir) (your question . . . is a knotty one, and such as, had I the wisdom of Solomon, I should be puzzled to answer —William Cowper) INVOLVED indicates an interweaving such that some parts return or seem to return upon themselves, as in certain difficult knots, making unraveling or understanding very hard (public issues are so large and so involved that it is only a few who can hope to have any adequate comprehension of them —O.L.Dickinson)

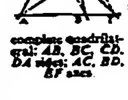
[illegible]

com·plete·ness [illegible] : the quality or state of being complete 2 *of an axiomatized system of logic* : the state of being so constituted that a contradiction arises through the addition of any formula not previously deducible from the axioms of the system

complete pair *n* : CLOSED PAIR

complete primitive *n* : the complete integral regarded as the basis of the differential equation

complete quadrilateral *n* : a figure that is determined by four coplanar lines, and has four sides and three diagonal lines, each two of which cut the other harmonically in three centers of which one or even two may be at infinity



complete quadrilateral: *AB, BC, CD, DA* sides; *AC, BD, EF* axes

complete solution *n* : GENERAL SOLUTION

complete stop *n* : a set of organ pipes extending throughout the compass of the manual

com·ple·tion \kəm'plēshən\ *n* -s [L completion-, completio filling, fr. completus (past part. of complēre to complete) + -ion-, -io -ion — more at COMPLETE] 1 : the act or action of completing, becoming complete, or making complete (his ~ of the late artist's unfinished masterpiece); *specif* : a forward pass caught by the receiver (out of 10 attempted passes, there were 3 ~s) 2 : the quality or state of being complete : FULFILLMENT (his desires having reached ~)

completion test *n* : an intelligence test requiring that the one to be tested complete a whole (as a sentence or picture) from which certain parts have been omitted

[illegible]